HRT 401
Physiology and Management of Herbaceous Plants
SYLLABUS

Spring Semester, 1999

Course Description

This course covers delivery of and physiological responses to light, temperature, nutrients, and gases (carbon dioxide and water vapor) of horticultural plants. Emphasis will be placed on how these environmental factors interact to influence plant growth rates, flowering, and yield.

OBJECTIVES

1) To develop an understanding of the physical process associated with the delivery of light, temperature, nutrients, and gases to herbaceous plants and

2) To develop an understanding of plant responses, emphasizing flowering and horticultural yield, to these environmental factors.

INSTRUCTORS

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Office Hours: Wednesday and Friday 9:00 to 10:00 or by appointment

CLASS SCHEDULE

Lecture: Monday, Wednesday, and Friday 8:00 to 8:50
B109 Plant and Soil Science Building

TEXT AND READING MATERIALS

Greenhouses: Advanced Technology for Protected Horticulture by Joe J. Hanan
Lecture notes downloadable from the following Internet site:

http://sutera.hrt.msu.edu/heins/index.htm

EVALUATION POLICIES

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PAPER: An eight- to ten-page paper is required on a topic selected jointly between the student and instructor. The topic can be on any area of information covered in the course. Information in the paper should provide information beyond that presented in the class. Intermediate and final due dates are listed below.

January 29  Topic selected and accepted by instructor
February 15 Paper outline due to instructor
February 19 Outline returned
March 22 First draft due for peer review
March 26 First draft returned
April 2 Final draft due to instructor

All papers shall be properly referenced with a minimum of 10 citations from sources other than a textbook. Typically, at least half of the references should be scientific articles published in the 1990's. All drafts of the papers shall be prepared on a word processor; hand written papers are not acceptable.
PROJECTED OUTLINE OF TOPICS BY DATE - 1999

Jan
11 Introduction
13 Light
15 Light
18 Light
20 Light
22 Light
29 Light (Paper topic chosen)

Mar
8-12 Spring Break
15 Carbon dioxide
17 Carbon dioxide
19 Carbon dioxide (1st draft due)
22 Flowering
24 Flowering (1st draft returned)
25 Light
26 Flowering
27 Light
29 Flowering
31 Flowering (Paper due)

Feb
1 Light
3 Light
5 Light

8 First Exam
10 Water vapor
12 Water vapor
15 Water vapor (Paper outline due)
17 Temperature
19 Temperature (Outline returned)

Mar
1 Temperature
3 Temperature
5 Second Exam

April
2 Flowering/review
5 Third Exam
7 Nutrition
9 Nutrition
12 Nutrition
14 Nutrition
16 Nutrition
19 Nutrition
21 Water relations
23 Water relations
26 Water relations
28 Water relations
30 Water relations
3 Monday Final exam (7:45 - 9:45 a.m.)
MAJOR TOPICS COVERED DURING COURSE:

Basic principles of radiometry
Measurement systems of "light"
The three properties of radiant energy
Light from electrical sources
Factors influencing total solar radiation
Plant responses to light, yield and quality
Supplemental (photosynthetic) lighting
Factors influencing light quality
Plant responses to light - photomorphogenesis

Water vapor quantity
Effect of atmospheric water vapor on transpiration
Plant responses to humidity

Plant temperature
Energy Transfer - radiation
Energy transfer - conduction and convection
Energy transfer - transpiration
Plant temperature in the greenhouse environment

Basic principles of temperature
Rate of development
Thermal time concepts
Thermoperiodism/thermomorphogenesis
Soil temperature vs. air temperature
Chilling injury

Carbon dioxide availability
Plant response to carbon dioxide
Whole plant responses to carbon dioxide enrichment
Problems with carbon enrichment
Pollutants
CO₂ delivery

Photoperiodic control of flowering
Photoperiodic responses and definitions
Photothermal responses
Obligate and quantitative responses
Components of SD photoperiod processes
Measurement of the night length
Photoperception
Critical photoperiods
Inductive cycles
Site of photoperception
Keeping short day plants vegetative
Components of LD photoperiod processes
Rate of progress towards flowering
Vernalization
Juvenility
Induction, partial development, dormancy, cold, development flowering system
Day neutral, temperature driven plants.

Nutritional Management of Plants
Determination of nutrient requirements
Management of mineral-nutrient availability to plants
Regulation of uptake, distribution, and utilization of mineral nutrients by plants
Plant response and management in ture management
Chilling nutrient-stress environments
Diagnosis of potential nutritional disorders

Plant-water management
Determination of plant requirements for water
Management of water quality
Estimating transpirational water losses from crops
Strategies for plant-water management in diverse crops
Plant adaptation to water stresses